The Efficacy of CDA with Post Emergence Wild Oat Herbicides

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Interest in the Controlled Droplet Applicator (CDA or Spinning disc nozzle) has been increasing recently. Since commercial units have been available there has been considerably more incentive to determine their potential for Western Canadian conditions. Studies conducted at the University of Saskatchewan, Agricultural Engineering Department in 1979, indicated that these units produced droplets in a much narrower range than conventional hydraulic nozzles. The spray drift was reduced, and the efficacy of the few herbicides tried appeared to be at least equal to that obtained with hydraulic nozzles with much less volume of diluent. There was insufficient testing to show the effectiveness of reduced water or herbicide dosages.

In 1980 a program was initiated in which four post emergence wild oat herbicides were tested using the CD applicator and comparing the results with those obtained with the normal hydraulic nozzles. The program was continued in 1981 with only minor revisions.

The herbicides used in the program were barban (Carbyne, Wypout), diclofop methyl (Hoe-grass), difenzoquat (Avenge 200C) and flamprop methyl (Mataven). The rates used for each herbicide were the standard recommended rate for each herbicide and 80% of the standard rate. In 1980 a 60% level of the standard rate was also used in part of the program. The volume of diluent for hydraulic nozzles was 58 l/ha for the TJ 800067 nozzle and 111 l/ha for the TJ 80015 nozzle. The standard volume of the CD applicator was 44 l/ha. In one test where a constant concentration of diluent was used, volumes were increased to obtain increases in dosage rate. In other tests the flow rate of the C.D. applicator was reduced to produce diluent volumes of 33 and 22 l/ha. In these same tests the two available disc speeds were used at the three volumes indicated as well as the two dosage rates. The standard disc speed was 2000 RPM while the alternate speed was 5000 RPM which produced very fine droplets. Wheat was the only crop used in the program. Wild oats were seeded just a few days before the crop to assure a fairly uniform infestation.

Assessment of the results was based upon several visual control ratings (0=no control 9=complete control) taken at various stage between herbicide application and crop maturity; wild oat plant and panicle counts; dry weight of wild oats and the yield of the crop.

Over the two year period there were differences in the way each herbicide reacted from one year to the next. In 1980 the wild oat numbers were only about one fifth of what they were in 1981 and therefore less pressure on the crop. Wild oat emergence was also very uneven in 1980 and therefore poorer results from the treatments applied in the earlier stages of growth such as barban and diclofop methyl.

Barban and diclofop methyl resulted in better control in 1981 than the same treatments in 1980 whereas difenzoquat and flamprop methyl did not perform as well in 1981 as in the previous year.

A comparison of the two nozzle types (hydraulic and C.D.A.) indicated that of 32 direct comparisons including the four herbicides 21 favored the hydraulic nozzle for level of control, six were equal and 5 favored C.D.A. These ratings were from the visual scoring data. Using the relative index criteria where $\frac{\text{Panicle No. x Dry wt (gms)}}{\text{Plant no.}} = \text{RI}$ the comparisons showed 26 to favor the hydraulic nozzle and six favored the C.D.A. Some of the differences were not large in either direction. The degree of control was not taken into consideration in this set of comparisons.

Acceptable control depended to a large extent on dosage rate and the herbicice used. The following summary table shows the percentage of comparisons that rated as acceptable, using 77 percent or 7 on a rating of 0-9 scale as being the low limit of acceptable control.

Table I - Percentage of Comparisons showing acceptable Control for each Herbicide, dosage rate and nozzle type.

Herbicide	Recommended Rate		80% of Recommended Rate	
	Hydraulic	CDA	Hydraulic	CDA
	%	%	%	%
Barban	50	50	25	0
Diclofop methyl	100	50	100	25
Difenzoquat	100	50	75	50
Flamprop methyl	100	75	100	100

In 1980 flamprop methyl was giving acceptable control at 60% of the recommended rate using the CD applicator. The same rate was not applied with a hydraulic nozzle. It was the only herbicide that provided acceptable control at the 60% level of the recommended rate.

In another series of tests the herbicides diclofop methyl and flamprop methyl were applied with the C.D. nozzle using the same dosage rates as in the previous tests i.e.: 100 and 80% of recommended rates, at three levels of volume or flow rate (1980 - 45,30,15 l/ha; 1981-44, 33,22 l/ha). Each of the dosage rates and volumes were applied at the two available disc speeds, 2000 and 5000 RPM. The check or control treatments included the corresponding dosage rates at the regular volume 111 l/ha and two untreated plots. In 1981 drop cards

(a moisture sensitive card was used to get a visual concept of the type of spray coverage that was applied by these treatments (Figure 1).

The efficacy of diclofop methyl increased at the higher disc speed in both years. Efficacy tended to decrease with decreased volumes, however the change was less at the high speed than the low speed of the disc. The two highest volumes provided acceptable control at the highest dosage level. The lower dosage level provided acceptable control at the highest volume and disc speed only.

Wild oat control was not acceptable at the lowest volume used regardless of dosage or disc speed. The C.D.A. treatments did not produce quite as high a level of control as the hydraulic nozzle in this test in either year.

The results with flamprop methyl varied considerably between years. In 1980 the only treatment in question was the lowest volume (15 l/ha) at high disc speed and both dosage levels. They were bordering the low end of the acceptable level. All other treatments compared very favorably with the hydraulic nozzle treatments. The lower disc speed was more effective than the high speed with this herbicide.

In 1981 the results with flamprop methyl left something to be desired. The initial stoppage in growth following application appeared to be normal and quite good initial (visual) ratings were recorded. However when moisture was received later in the season a number of the wild oats recovered in varying degrees. By the time the crop matured the wild oats had headed but were still green. Samples were taken from all plots and classified as to good control, partial control and no control. Assessments were made on this basis as well as visual scoring. None of the treatments showed an acceptable level of control including those applied with the hydraulic nozzle but there were some differences. The difference between dosage rates was minimal. Decreasing the volume of diluent decreased control slightly. The higher disc speed, however, increased control by about 10% which was a reversal from the previous year's results.

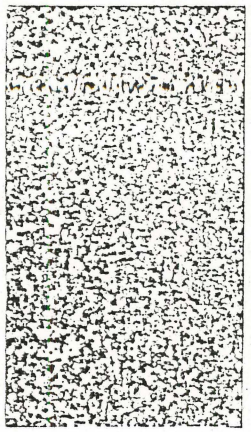
The reasons for the difference in results between years in this test is not clear but some possibilities can be offered:

1. Much higher wild oat populations.
2. Herbicide applied at the four leaf stage in 1981 and the five leaf stage in 1980.
3. Relatively poor crop emergence in 1981.
4. Drought stress until the shot blade stage.

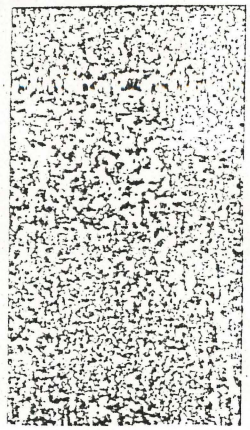
In conclusion it can be said that in most instances the hydraulic nozzle provided a higher degree of control than the CDA system. Some of the differences, however were quite small. The results did show that acceptable control could be obtained with some herbicides with relatively low volumes of diluent.

The smaller droplets of the higher disc speed certainly appeared to be helpful in improving efficacy, however they could cause drift problems under many spraying conditions. In view of the variation in results between years with these herbicides it is difficult to state which herbicide was best suited to CD application. In the first year flamprop methyl led the way whereas in 1981 diclofop methyl provided the most consistent results.

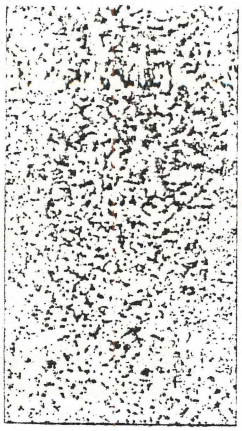
5000 RPM, .56 kg/ha SPINNING DISC



44 l/ha
800 cc/min

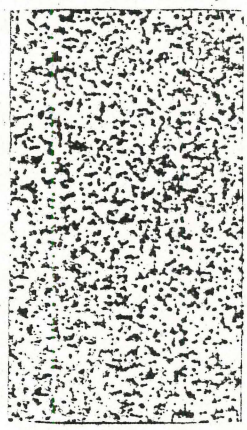


33 l/ha
600 cc/min

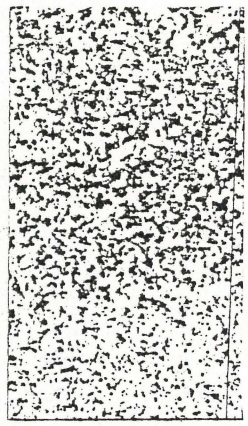


22 l/ha
400 cc/min

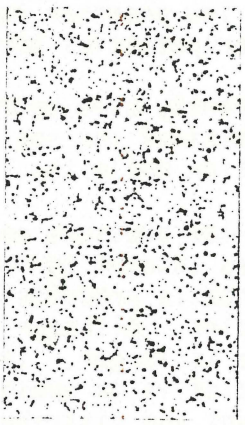
2000 RPM, .56 kg/ha SPINNING DISC



44 l/ha
800 cc/min



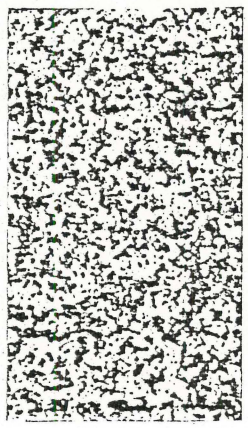
33 l/ha
600 cc/min



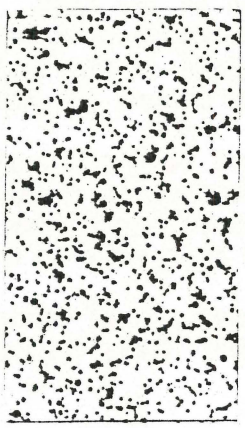
22 l/ha
400 cc/min

SPINNING DISC
800 cc/min

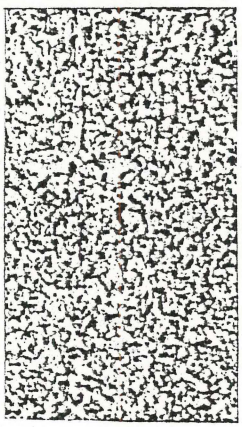
HYD. NOZZLE
80015



2.6 mph
.7 kg/ha
55 l/ha



3.2 mph
.56 kg/ha
2000 rpm
44 l/ha



.56 kg/ha
111.4 l/ha